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TI Corrosion-resistant bronze alloy
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AB The alloy comprises Cu 85-88, Pb \leq 1, Zn 4-6, Bi 0.5-2.5, Sn 4-6, P \leq 0.05, Se 0.35-1.2, Sb \leq 0.25, and Mg 0.1-1.0 wt,% optionally containing 0.05-0.2% misch metal. The alloy shows less dissoln. of Pb in water to be useful for components in waterworks.

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Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]

[Claim 1] The bronze alloy which is characterized by being 0.35 to 1.2% of Se, less than Sb0.25%, and 0.1 to 1.0% of Mg P 0.05% or less by a bulk density as for 85 to 88% of Cu, less than Pb1%, 4 to 6% of Zn, 0.5 to 2.5% of Bi, and 4 to 6% of Sn.

[Claim 2] The bronze alloy which is characterized by being 0.35 to 1.2% of Se, less than Sb0.25%, 0.1 to 1.0% of Mg, and 0.05 to 0.2% of a misch metal P 0.05% or less by a bulk density as for 85 to 88% of Cu, less than Pb1%, 4 to 6% of Zn, 0.5 to 2.5% of Bi, and 4 to 6% of Sn.

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This copper alloy is used for the water-contacting metal fittings for common piping instruments, water supply system equipment, the other bibcock metal-fittings and equipment metallurgy implement for water supply systems, etc. about a bronze alloy, for example, characteristics of this invention, such as corrosion resistance, machinability, resistance to pressure, soundness, and an antiseizure property, are good, and it is related with a bronze alloy gentle also to water quality.

[0002]

[Description of the Prior Art] Generally, a bronze cast (CAC406 (BC6)) is excellent in fluidity, corrosion resistance, machinability, and resistance to pressure, and since its fluidity at the time of melting is good and it fits to some extent complicated-shaped cast components, they are used from before. [to common piping instruments, such as a valve, a cock, and a joint, etc.] [many]

[0003] Since this CAC406 (BC6) is called what is called 85-5-5-5 alloy (85%Cu, 5%Sn, 5%Pb, 5% Zn), a healthy casting is easy to be obtained and Pb is moreover contained 5% Since machinability of a mechanical property is good especially good, the actual condition is mostly used to the water-contacting metal fittings for this kind of piping instruments.

[0004] Where high temperature hot water is touched especially, when it used this bronze alloy for the ingredient of water-contacting metal fittings, such as a valve, or these water-contacting metal fittings are used, The lead contained without almost dissolving to a bronze cast is eluted underwater, water quality is worsened, and especially, since the water containing lead will be drunk, it is not desirable to use this kind of alloy for the piping instrument of potable water and the instrument for water-works tubing. It is tended further strictly therefore, for it to be in the inclination to decide the elution reference value with which lead from a piping instrument to [from the consideration on environmental protection] water is eluted, and to decide this reference value these days.

[0005] By the way, in order to prevent this kind of air pollution based on lead particles, lead is replaced by Se and Bi and the bronze cast which lessened leaden content is proposed. This bronze cast shall be called SEBIROI <1> (SeBiLOY <1>) (trademark) and SEBIROI <2> (SeBiLOY <2>) (trademark) as shown below, and this copper alloy shall have cleared the predetermined lead elution basis (refer to U.S. Pat. No. 5614038 gazette).

[0006]

[Table 1]

| 成 分 | SeBiLOY<1> (%) | SeBiLOY<2> (%) |
|-----|----------------|----------------|
| Cu | 86.0-88.0 | 85.0-87.0 |
| Fe | 0.30 | 0.30 |
| Pb | 0.25 | 0.25 |
| Ni | 1.0 | 1.0 |
| Zn | 4.0-6.0 | 4.0-6.0 |
| Bi | 0.5-1.5 | 1.5-2.5 |
| Sn | 4.0-6.0 | 4.0-6.0 |
| P | 0.05 | 0.05 |
| Se | 0.35-0.7 | 0.8-1.2 |
| Sb | 0.25 | 0.25 |
| S | 0.08 | 0.08 |
| Al | 0.005 | 0.005 |
| Si | 0.005 | 0.005 |

[0007] [2] as this SEBIROI <1> and <2> are shown in Table 1, while stopping leaden content to 0.25% or less He prevents eluting lead and is trying to meet the lead elution basis by changing into the condition that Se (compound) and Bi enclose lead (Pb), as Bi and Se are added and it is shown in the sketch of the form of organization of drawing 2 .

[0008]

[Problem to be solved by the invention] As for this kind of copper alloy, it is desirable to use abundantly and manufacture a recycling material based on effective use of a resource or consideration of environment. however, [most recycling materials which are circulating now] Since lead contains, when SEBIROI <1> which is a Cu-Zn-Sn-Bi-Se system bronze alloy, and <2> are

manufactured using a recycling material, adjusting leaden content so that the default of SEBIROI may be suited has forced a very difficult and difficult activity.

[0009] [the place which results in development and is wholeheartedly made into the object as a result of investigation in order that this invention may obtain a copper alloy gentle also to saving-resources-izing and water quality in view of the conventional actual condition] Even if it changes leaden content somewhat by the quality of the raw material used for the copper alloy which contained Se, Bi, etc. as a leaden displacement ingredient, it is in offering the bronze cast with which it is satisfied of a predetermined lead elution basis.

[0010]

[Means for solving problem] Invention in Claim 1 is a bronze alloy which is a bulk density and are P 0.05% or less and 0.35 to 1.2% of Se of 85 to 88% of Cu, less than Pb1%, 4 to 6% of Zn, 0.5 to 2.5% of Bi, and Sn [4 to 6% of], less than Sb0.25%, and 0.1 to 1.0% of Mg.

[0011] Invention in Claim 2 is a bulk density. They are P 0.05% or less and 0.35 to 1.2% of Se of 85 to 88% of Cu, less than Pb1%, 4 to 6% of Zn, 0.5 to 2.5% of Bi, and Sn [4 to 6% of], less than Sb0.25%, 0.1 to 1.0% of Mg, and the bronze alloy that is 0.05 to 0.2% of a misch metal.

[0012]

[Mode for carrying out the invention] The embodiment of a bronze alloy excellent in the corrosion resistance in this invention is explained. This bronze alloy is a rate of a bulk density, Zn considered it as 4 to 6% by Cu having considered it as 85 to 88%, Sn used 4 to 6% as the principal component, and the form containing the constituent element mentioned later is used for it.

[0013] Although Mg of invention in Claim 1 dissolves in small quantities in SEBIROI <1> and the Cu-Zn-Sn-Bi-Se system bronze alloy represented by <2>, the most forms independence or a compound in a crystal grain boundary and a grain, and it exists. On the other hand, since lead has the degree of dissolution of Mg and some, in addition to becoming chemical more stable, Mg and Mg compound deposit in the form which encloses lead (refer to the sketch of the form of organization of drawing 1). Moreover, since this Mg and Mg compound serve as a form which encloses further Se (compound) which enclosed lead, and Bi, they can prevent leaden elution doubly by surrounding lead directly or indirectly. Therefore, according to this invention, even if it makes lead increase to a certain amount, the leaden amount of elution can be controlled low. Having made the maximum of Mg into 1 weight % takes the fluidity in a actual alloy into consideration.

[0014] The misch metal of invention in Claim 2 is set in said component range. By adding rare-earth-elements mixtures, such as Fe0.44%, to a bronze alloy Ce54%, La23.2%, Nd16.8%, Pr6%, Sm0.03%, and A10.05% While leaden distribution equalization and detailed-ization are made and being able to control leaden elution, it is possible by forming a detailed intermetallic compound to also raise machinability. The ceiling value of the content of a misch metal was made into 0.2 weight % because change was not accepted even if the dispersion effect of lead by adding a misch metal adds the amount beyond it. On the other hand, the lower limit was made into 0.05 weight % because a clear effect was not accepted in lead elution prevention in the amount not more than it.

[0015] Zn becomes suitable for the metal fittings excellent in fluidity for piping instruments by considering it as 4 to 6% by Sn considering it as 4 to 6 weight % for improvement in growth and abrasion resistance of hardness and hardness, and corrosion resistance.

[0016] Pb is contained 1.0 or less weight %. Even if this component is the case where lead is eluted underwater, it is the range which can stop the amount of elution of that lead low, and is the range which made it possible to also raise machinability, an antiseizure property, and resistance to pressure from conventional SEBIROI <1> and the bronze alloy of <2> by containing Pb in this component range. When using a recycling material abundantly and manufacturing a copper alloy especially, it is also the range contained actually.

[0017] Moreover, P is added 0.05 or less weight %. There is work which raises abrasion resistance more by P's functioning as a deoxidizer at the time of casting, raising fluidity, being connected with Cu, and forming the intermetallic compound of Cu₃P.

[0018] Bi is added 0.5 to 2.5weight %. Bi is the constituent element which is harmless also as potable water and can raise machinability and an antiseizure property, without almost dissolving to Cu, Sn, and Zn which are a bronze principal component. If the above-mentioned performance of Bi does not demonstrate that the Reason for having made Bi into this addition ingredient range is less than 0.5% but 2.5% is exceeded, the amount of crystallization of Bi will increase and a mechanical strength will fall.

[0019] Se is added 0.35 to 1.2weight %. This Se forms Zn, Cu, and an intermetallic compound in an alloy, and it is effective in raising machinability. Moreover, since ZnSe and a Cu₂Se compound are insoluble in water, they have prevented elution of Se.

[0020]

[Working example] The example of the bronze alloy which was excellent in the corrosion resistance in this invention below is explained in full detail. As an example, it examined about the alloy which added Mg, and Mg and the alloy which added the misch metal based on the Cu-Zn-Sn-Bi-Se system bronze alloy (SEBIROI <2>). The presentation of an alloy made into the test specimen is shown in Table 2. Here, the series of a test specimen A adds lead about 0.5weight % to said Cu-Zn-Sn-Bi-Se system bronze alloy.

[0021]

[Table 2]

Bal: 残余

| 供試材 | Cu | Zn | Sn | Pb | Bi | Se | P | Sb | Mg | MMetal |
|-----|-----|------|------|------|------|------|------|------|------|--------|
| A-0 | Bal | 5.31 | 5.31 | 0.51 | 1.92 | 0.88 | 0.02 | 0.04 | 0 | 0 |
| A-1 | Bal | 5.47 | 5.21 | 0.47 | 1.84 | 0.84 | 0.01 | 0.03 | 0.31 | 0 |
| A-2 | Bal | 5.50 | 5.34 | 0.48 | 1.86 | 0.88 | 0.01 | 0.05 | 0.58 | 0 |
| A-3 | Bal | 5.49 | 5.31 | 0.50 | 1.91 | 0.91 | 0.02 | 0.03 | 0.29 | 0.19 |
| A-4 | Bal | 5.52 | 5.40 | 0.49 | 1.97 | 0.94 | 0.02 | 0.04 | 0.60 | 0.20 |
| B-0 | Bal | 5.51 | 5.40 | 1.19 | 1.94 | 0.90 | 0.01 | 0.04 | 0 | 0 |
| B-1 | Bal | 5.40 | 5.38 | 1.22 | 1.90 | 0.88 | 0.01 | 0.03 | 0.29 | 0 |
| B-2 | Bal | 5.46 | 5.39 | 1.20 | 1.88 | 0.89 | 0.01 | 0.04 | 0.60 | 0 |
| B-3 | Bal | 5.37 | 5.42 | 1.24 | 1.91 | 0.90 | 0.02 | 0.04 | 0.31 | 0.19 |
| B-4 | Bal | 5.57 | 5.30 | 1.17 | 1.86 | 0.86 | 0.01 | 0.04 | 0.61 | 0.19 |

[0022] The test specimen A-0 is not making Mg or a misch metal contain as an ingredient for comparing with other test specimens concerning this invention. The alloy concerning this invention to which the ***** material A-1 and A-2 added Mg to the test specimen A-0, a test specimen A-3, and A-4 are the alloys concerning this invention which added Mg and a misch metal to the test specimen A-0.

[0023] It dissolved by combination of Table 2 with the high frequency fusion furnace in the air, and with the sand mold mold, after casting, each test specimen was all processed and created four cylinders of phi50x60 each for every test specimen. It is JIS about this cylindrical test specimen. It examined based on the transudatory ability examining method by S3200-7. The result is shown in drawing 3 .

[0024] The amount of lead extraction of a test specimen A-0 is 0.015 mg/L. Like this invention, this means satisfying the present lead elution basis (for example, 0.05 or less mg/L), if leaden content is about 0.5 weight % even if it does not make Mg or a misch metal contain. However, this value cannot satisfy the lead elution basis (for example, 0.01 or less mg/L) currently guided by Ministry of Health and Welfare as a set point, for example.

[0025] The test specimen A-1 is making Mg contain 0.31weight %, and the amount of lead elution is 0.007 mg/L. The test specimen A-2 is making Mg contain 0.58weight %, and the amount of lead extraction is 0.006 mg/L. Therefore, meeting the lead elution basis currently guided by Ministry of Health and Welfare as a set point is checked by adding Mg.

[0026] A test specimen A-3 makes Mg contain 0.29weight %, the misch metal is contained further 0.19weight %, and the amount of lead extraction is 0.006 mg/L. A test specimen A-4 makes Mg contain 0.60weight %, the misch metal is contained further 0.20weight %, and the amount of lead extraction is 0.004 mg/L. Therefore, in addition to Mg, the severe lead elution basis can be further met more effectively by adding a misch metal.

[0027] The series of a test specimen B adds lead about 1.2weight % to a Cu-Zn-Sn-Bi-Se system

bronze alloy (SEBIROI <2>).

[0028] The test specimen B-0 is not making Mg or a misch metal contain as an ingredient for comparing with other test specimens. The alloy with which a test specimen B-1 and B-2 added Mg to the test specimen B-0, a test specimen B-3, and B-4 are the alloys which added Mg and a misch metal to the test specimen B-0.

[0029] The manufacture method of each test specimen, the configuration, and the extraction test method are the same as that of the test specimen of A series. The result is shown in drawing 3.

[0030] The amount of lead extraction of a test specimen B-0 is 0.022 mg/L. Like this invention, this means satisfying the present lead elution basis (0.05 or less mg/L), if leaden content is about 1.2 weight % even if it does not make Mg or a misch metal contain. However, it cannot be satisfied with this of the lead elution basis (0.01 or less mg/L) currently guided by Ministry of Health and Welfare as a set point.

[0031] The test specimen B-1 is making Mg contain 0.29weight %, and the amount of lead extraction is 0.013 mg/L. The test specimen B-2 is making Mg contain 0.60weight %, and the amount of lead extraction is 0.011 mg/L. Therefore, although it is accepted that the leaden amount of extraction becomes less by adding Mg like the test specimen of A series which contains lead about 0.5weight %, by the time it meets the lead elution basis currently guided by Ministry of Health and Welfare, it will not have resulted.

[0032] A test specimen B-3 makes Mg contain 0.31weight %, the misch metal is contained further 0.19weight %, and the amount of lead extraction is 0.011 mg/L. A test specimen B-4 makes Mg contain 0.61weight %, the misch metal is contained further 0.19weight %, and the amount of lead extraction is 0.011 mg/L. Therefore, although it is admitted that it can become same to add a misch metal further in addition to Mg the cause which reduces the leaden amount of extraction further in the test specimen of A series which contains lead about 0.5weight %, by the time it meets the lead elution basis currently guided by Ministry of Health and Welfare as a set point, it will not have resulted.

[0033] making the component range of lead in this invention into 1 or less weight % from the above-mentioned test result -- this range -- be -- [with addition of ** Mg and a misch metal] The severe lead elution basis can be met also in the bronze alloy containing Se represented by the Cu-Zn-Sn-Bi-Se system bronze alloy (SEBIROI <1>, <2>), Bi, etc.

[0034] Although it has controlled the leaden amount of elution by adding Mg, even if this invention adds Ca, it is effective. The sum of one side of Mg and Ca or both sides of this component range should just be 0.1 to 1.0 weight %. Ca forms lead and a compound phase like Mg, and exhibits the performance to prevent leaden elution.

[0035] In addition, although this invention has controlled the leaden amount of elution by adding a misch metal combining Mg, it may add only a misch metal 0.05 to 0.2weight %, and can reduce leaden elution even in this case.

[0036] [the example] although the above-mentioned example is applied to piping instruments, such as valve member articles, such as a valve for potable water, a stem, a valve seat, and JISUKU,

bibcock, and a joint, and the instrument for water-works tubing In addition, components, such as warm water related equipments, such as instruments, such as a strainer which ****, a pump, and a motor, or bibcock metal fittings which ****, and also a water heater machine, and a waterworks line, a member, etc. are further used for medium articles in addition to the above-mentioned final product, an assembly object, etc., such as a coil and a hollow rod, widely.

[0037]

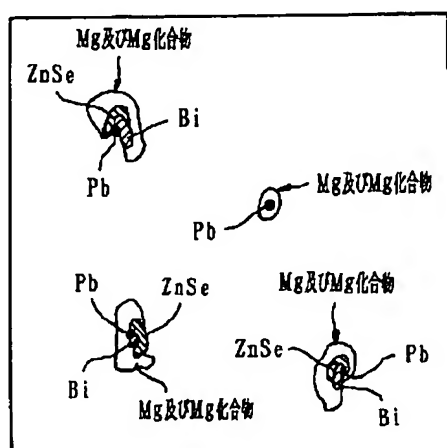
[Effect of the Invention] While Se and Bi adhere to lead according to this invention so that clearly from the above thing Since leaden elution is doubly prevented by wrapping these in Mg or Mg, and a misch metal further, In manufacture of the conventional copper alloy which contained Se, Bi, etc. as a leaden displacement ingredient, even if it changes leaden content somewhat by the quality of a raw material, the effect which was [offer / the bronze cast with which it is satisfied of a severe lead elution basis] excellent is done so.

[Brief Description of the Drawings]

[Drawing 1] It is the sketch having shown the form of organization (x400) of the bronze alloy in this invention.

[Drawing 2] It is the sketch of the form of organization (x400) of the Cu-Zn-Sn-Bi-Se system bronze alloy in which the conventional example was shown.

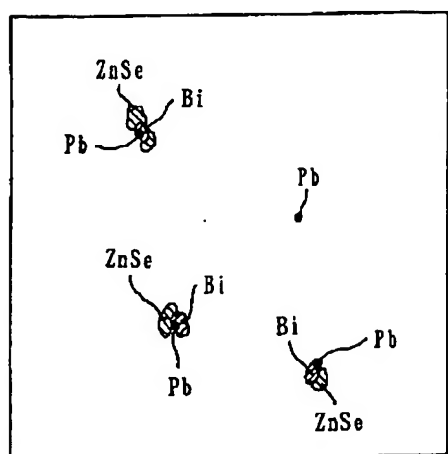
[Drawing 3] It is the graph which showed the lead extraction test result in this invention.



[Drawing 1]

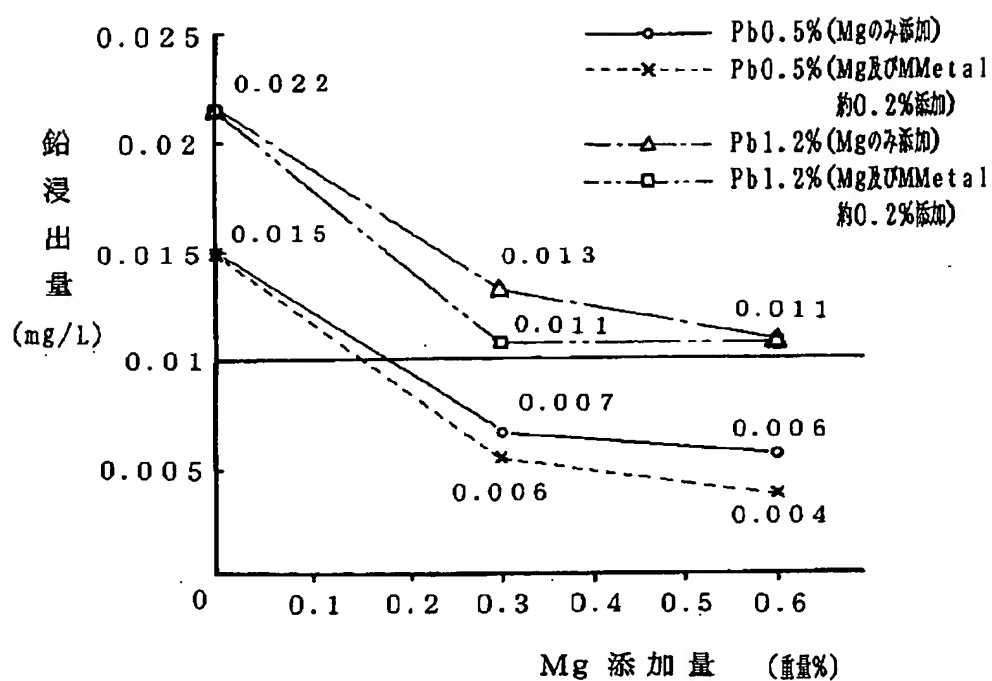
(× 4 0 0)

[Drawing 2]



(× 4 0 0)

[Drawing 3]



[Translation done.]